

Energy Systems Integration Facility Workshop



Hydrogen and Fuel Cell Systems Integration

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ESIF Purpose



Workshop Breakouts

- Electricity Systems
- Bulk Power Systems
- Thermal Systems and Buildings
- Hydrogen and Fuel Cells systems

Topics of Discussion

- **How do Renewable Energy and Energy Efficient technologies fit into your goals?**
- **What are the top 3 challenges you face?**
- **Which ESIF capabilities can help you overcome those challenges?**
- **What type of capabilities are missing from the ESIF ?**

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How do Renewable Energy and Energy Efficient technologies fit into your goals?

- Biomass gasification systems to produce hydrogen and electricity – *Go Two Power*
- Highly efficient distributed generation – *Versa Power Systems*
- Highly efficient industrial-scale electrolyzers – *Teledyne Energy Systems*
- We have a renewable portfolio standard – *Xcel Energy*

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What are the top 3 challenges you face?

- **1. How to produce hydrogen cheaply from renewable energy.**
- **2. Cost of renewable energy balance of plant systems.**
- **3. Maintenance and durability of renewable energy equipment, for example fuel cells.**

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Which ESIF capabilities can help you overcome those challenges?

- **Accelerated life cycle testing**
- **Materials and components testing**
- **Standard designs for integrated systems**
- **Listed components and systems to ease permitting process, for example UL listed**

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What type of capabilities are missing from the ESIF ?

- **Testing capability for solid oxide fuel cells and stacks at high temperature**
- **Fuel cell single cell and short stack testing capability at pressures up to 10 atmospheres**